Integrated Water Quality and Aquatic Communities Protocol – Mountain Lakes and Ponds

Standard Operating Procedure (SOP) #8: Water Sample Collection

Draft Version 1.0

Revision History Log:

Previous Version	Revision Date	Author	Changes Made	Reason for Change	New Version

This SOP describes the tasks associated with collecting the water sample for laboratory (e.g., nutrients, anions, Chlorophyll *a*, etc.) as well as field analyses (alkalinity; although the methodology for this is in SOP #9: Water Sample Filtration and Handling). It also describes the methodology for associated tasks that should be done during the similar time period (e.g., secchi disk depth and max depth).

Order of Tasks

Certain tasks presented here pose a risk of stirring up bottom sediments, which can contaminate a water sample. (**The protocol is for sampling the water, not the water and sediments!**) Because of this, it is necessary for the crews to perform the collections in the following order:

1. Find the deepest portion of the lake.
2. Collect the water sample at 0.5 m above the lake bottom.
3. Collect the water sample at 0.5 m below the lake surface.
4. Take a secchi disk measurement.
5. Return to shore for filtering and processing samples.

Finding the Deepest Portion of the Lake

Water collection should occur in the deepest portion of the lake. In lakes or ponds that have a uniform depth, collection should occur near or in the middle of the lake (i.e., maximize the distance from any shoreline). The crew member assigned to this task should paddle the boat to potential deep spots, where the water clarity indicates depth or the lake shoreline suggests the deepest spot may be. As the crew member visits these spots, he or she should test the depth with the hand-held sonar, following the manufacturer's instructions. This generally entails a simple process of holding the sonar vertically, with the tip just below the water surface. The crew member depresses a button or switch, and the depth reading is displayed. Care must be taken to ensure that the sonar is held upright and not at an angle.

Upon finding the deepest portion of the lake, the crew member should make visible references to the lake shores to help triangulate his or her position. The depth should be recorded on the dive slate and the crew member should prepare to collect the deep water sample.

Collecting Water Samples

Water samples should be collected using a Beta Van-Dorn Style water sampler. Crew members should be familiar with the sampler's operation before venturing out into the lake. Prior to collection, the crew should rinse the sampler and the 2 L collection bottles (labeled "shallow" and "deep") with water from the lake.

1. At the deepest portion of the lake, the ends of the bottle should be locked "open" by securing the cable to the appropriate pegs (Figure 1).
2. Once locked open, the bottle should be slowly lowered by the line (marked in 0.5 m intervals) until the bottle is 0.5 m above the lake bottom.
3. Once at the appropriate depth, the weighted messenger attached to the line is released down the line so that the trigger mechanism is activated, releasing the bottle endcaps.
4. The water sampler is then brought back to the surface and drained into the 2 L amber Nalgene collection bottle.
5. The procedure is repeated in the same location for the shallow sample, 0.5 m below the lake surface.

Important note: If upon retrieval of the deep sample, the crew member notices copious sediments, the sample should be retaken in a similarly deep section. Likely, the technician stirred up the bottom sediments while deploying the sampler, resulting in sample contamination. For this reason, the hand-held sonar should be used immediately prior to the water sample collection to confirm that the crew member is still in the deepest portion of the lake, and that they are deploying it at the correct depth.

In windy conditions, it may be difficult for the crew member to maintain their position. Deployment of a simple anchor, made up of a small bag of rocks tied to a long line can help; the crew member needs to be aware that anchor deployment can similarly stir up sediments, contaminating the sample. For this reason, anchors should not be deployed until after the collection of the deep water sample.

If the lake is less than 2 m deep, follow the above protocol, but only take a single sample at the midpoint.

Water Clarity

Water clarity should be measured with a 20 cm black and white Secchi disk at the deepest portion of the lake (where the water samples were collected). Sunlight intensity can affect the readings; if possible, the measurements should be made as close as possible to noon. However, the timing of site arrival and weather conditions (e.g., clouds) are subject to variability but

measurements can still be made. **Likewise, the use of polarized sunglasses can cause variability between users – ALL SUNGLASSES should be removed prior to measurement.**

1. At the deepest part of the lake, slowly lower the Secchi disk over the sunny side of the boat.
2. Record the depth at which the disk disappears from sight, start pulling it up, and then record the depth that it reappears on the dive slate. Repeat and record for a total of three times. Record time of day and surface conditions.
3. If the disk remains visible all the way to the bottom, check the box for "water clarity – 100%." Do not write the depth of the lake, as this may be misinterpreted as the depth where the disk disappeared or reappeared when in reality it was still visible.
4. Record notes about the basic clarity or coloration of the water (e.g., brown or reddish tinged water on the dive slate).
5. Return to shore and transfer Secchi depth data to master field sheet.